

REMARKS

Claims 1-15, 17 and 20-23 are pending in the application.

Claims 1-15, 17 and 20-23 are rejected.

Claims 5, 6, 11-19, and 23 are cancelled.

Claims 1, 20 and 22 are amended.

No new matter is added.

Claims 1-4, 7-10 and 20-22 remain in the case.

Claim Rejections – 35 U.S.C. § 103

Claims 11-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chang, et al., U.S. Patent No. 6,380,029, in view of Yeh, U.S. Patent No. 5,045,488.

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chang, et al., U.S. Patent No. 6,380,029, in view of Yeh, U.S. Patent No. 5,045,488, and further in view of Tsukamoto, et al., U.S. Patent No. 5,943,592.

Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chang, et al., U.S. Patent No. 6,380,029, in view of Yeh, U.S. Patent No. 5,045,488, and further in view of Zhang, et al., U.S. Patent No. 6,413,805.

These claims, 11-15, and 17, have been cancelled.

Claims 1-2, 4-5 and 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chang, et al., U.S. Patent No. 6,380,029 ("Chang"), in view of Tsukamoto, et al., U.S. Patent No. 5,943,592 ("Tsukamoto").

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chang, et al., U.S. Patent No. 6,380,029, in view of Tsukamoto, et al., U.S. Patent No. 5,943,592, and further in view of Yeh, U.S. Patent No. 5,045,488.

Claims 7-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chang, et al., U.S. Patent No. 6,380,029, in view of Tsukamoto, et al., U.S. Patent No. 5,943,592, and further in view of Zhang, et al., U.S. Patent No. 6,413,805.

In response to the above-mentioned rejections, claim 1 is amended to recite forming a metal silicide layer on the control gate layer, crystallizing the amorphous silicon layer by annealing the control gate layer after forming the metal silicide layer, and patterning the

control gate layer, the integrate dielectric layer, the floating gate layer and the metal silicide layer. Support for this amendment can be found on page 6, lines 13-30 of the present invention.

Chang, on the other hand, discloses that a polycrystalline layer 48 is already formed even before an annealing process is performed (see column 7, lines 47-50). For this reason, there is no need to crystallize an amorphous silicon layer as recited in claim 1 of the present invention. As a result, Chang is completely silent with regard to an annealing process required for crystallizing the amorphous silicon layer as recited in claim 1 of the present invention.

Instead, Chang merely discloses an optional annealing process (see column 7, line 67) for forming a tungsten silicide layer having no detectable microcracking (see column 8, lines 3-8). However, an annealing process of the present invention is performed to reduce a thickness variation of an ONO layer and to reduce a bird's beak phenomenon at the interface between the ONO layer and a second silicon layer. For this reason, the optional annealing process of the Chang reference is apparently different from that recited in claim 1 of the present invention. In other words, claim 1 recites that annealing results in crystallizing amorphous silicon. Chang, however, does not teach this.

Accordingly, the Chang reference fails to disclose or suggest the annealing process of the present invention, the annealing process being required for crystallization capable of reducing both the thickness variation and the bird's beak phenomenon.

Tsukamoto discloses a tungsten silicide layer (see column 5, lines 1-4) formed after an annealing process is performed on a second silicon layer (see column 5, 59-67). That is, the annealing process is performed on the second silicon layer. The tungsten silicide layer is then formed on the second silicon layer.

The annealing process of Tsukamoto is substantially similar to a conventional annealing process mentioned on page 6, lines 31-34, and page 7, lines 1-2 of the present application, as follows. The annealing process of the Tsukamoto reference has a problem in that the second silicon layer is abnormally grown during a formation of the tungsten silicide layer. To overcome the problem, the annealing process of the present invention is performed after the tungsten silicide layer is formed.

In addition, purposes of the annealing process of the Tsukamoto reference are crystallization and impurity diffusion (see column 5, lines 59-67). On the hand, the annealing process of the present invention is performed to reduce the thickness variation of the ONO layer and to reduce the bird's beak phenomenon at the interface between the ONO layer and

the second silicon layer, as well as to crystallize the second silicon layer. However, the Tsukamoto reference is completely silent with regard to reducing the thickness variation and reducing the bird's beak phenomenon.

Accordingly, the Tsukamoto reference fails to disclose or suggest the annealing process of the present invention, the annealing process being performed after the tungsten silicide layer is formed in order to reduce both the thickness variation and the bird's beak phenomenon.

Furthermore, the Examiner alleges on page 4 of the Office Action that it would have been obvious to a person of ordinary skill in the art at the time the invention was made to form a control gate layer by forming an amorphous silicon layer and then crystallizing the amorphous silicon layer because the control gate layer formed by crystallizing the amorphous silicon layer to form a polycrystalline silicon layer would yield a greater grain size layer compared to polysilicon layer in order to reduce ion diffusion, thus suppressing a voltage fluctuation." However it is respectfully submitted that the mere fact that the Chang and Tsukamoto references can be modified as suggested by the Examiner is not sufficient by itself to establish a prima facie case for obviousness. The Examiner's motivation for combining these references is not particularly clear. Moreover, this motivation does not show that the modifications of the Chang and Tsukamoto references are desirable, which is required to serve as a proper motivation. Thus, the Examiner has failed to provide a prima facie case for obviousness, and thus the rejection should be withdrawn.

For at least these reasons, the Applicants respectfully submit that the Chang and Tsukamoto references fail to disclose or render obvious the features recited in independent claim 1.

Claims 2-4 and 7-10 which depend from independent claim 1 are likewise distinguished over the applied art for at least the reasons discussed as well as for the additional features they recite. Reconsideration and withdrawal of the rejections are respectfully requested.

Claim Rejections – 35 U.S.C. § 102

Claims 20-23 are rejected under 35 U.S.C. 102(a) as being anticipated by Chang, et al., U.S. Patent No. 6,380,029.

In response to the above-mentioned rejections, claim 20 is amended to recite forming a floating gate layer on a tunnel dielectric layer, forming an oxide-nitride-oxide (ONO) integrate dielectric layer on the floating gate layer, forming a control gate layer including in-

situ doped amorphous silicon on the ONO layer, sequentially patterning the metal silicide layer, the control gate layer, the ONO layer and the floating gate layer, wherein the resultant structure is annealed after forming the metal silicide layer." Support for this can be found on page 6, lines 13-30 of the present invention.

On the other hand, a polycrystalline layer 48 of the Chang reference includes a polysilicon instead of in-situ doped amorphous silicon recited in claim 20 of the present invention.

Thus, the Chang reference does not teach or disclose all of the limitations of claim 20, and therefore this claim is believed to be allowable and the applicants respectfully request allowance.

Claims 21 and 22 depend from independent claim 20, and for at least the same reasons discussed above, these claims are believed to be allowable and the applicants respectfully request allowance.

Claim 23 has been cancelled.

For the foregoing reasons, reconsideration and allowance of claims 1-4, 7-10 and 20-22 of the application as amended is solicited. The Examiner is encouraged to telephone the undersigned at (503) 222-3613 if it appears that an interview would be helpful in advancing the case.

Respectfully submitted,

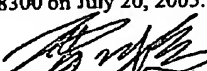
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